

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C. 20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 20 August 1999 (20.08.99)	
International application No. PCT/GB99/00228	Applicant's or agent's file reference PDG/20388
International filing date (day/month/year) 22 January 1999 (22.01.99)	Priority date (day/month/year) 22 January 1998 (22.01.98)
Applicant KNEE, Michael, James	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
03 August 1999 (03.08.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

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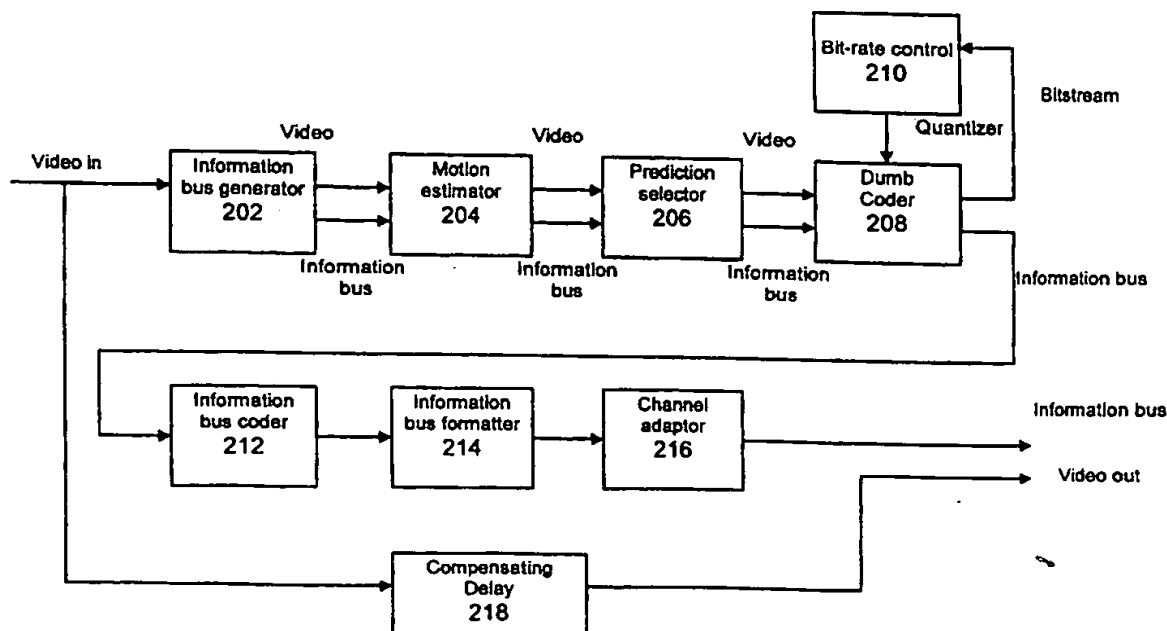
WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

PCT

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>H04N 7/26</b>	<b>A1</b>	(11) International Publication Number: <b>WO 99/38328</b> (43) International Publication Date: <b>29 July 1999 (29.07.99)</b>
(21) International Application Number: <b>PCT/GB99/00228</b> (22) International Filing Date: <b>22 January 1999 (22.01.99)</b> (30) Priority Data: <b>9801382.4</b> <b>22 January 1998 (22.01.98)</b> <b>GB</b> (71) Applicant (for all designated States except US): <b>SNELL &amp; WILCOX LIMITED [GB/GB]; 6 Old Lodge Place, St. Margaret's, Twickenham, Middlesex TW1 1RQ (GB).</b> (72) Inventor; and (75) Inventor/Applicant (for US only): <b>KNEE, Michael, James [GB/GB]; 6 Woodbury Avenue, Petersfield, Hampshire GU32 2EE (GB).</b> (74) Agents: <b>GARRATT, Peter, Douglas et al.; Mathys &amp; Squire, 100 Gray's Inn Road, London WC1X 8AL (GB).</b>		(81) Designated States: <b>AU, CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</b> Published With international search report.

(54) Title: VIDEO SIGNAL COMPRESSION



(57) Abstract

A video signal is analysed to determine what compression coding decisions would be taken if the video signal were to be MPEG2 encoded. A representation of these coding decisions then accompanies the un-coded video signal for use in a subsequent MPEG2 encoding process.

## VIDEO SIGNAL COMPRESSION

The invention relates to video signal compression.

In an important example, the invention concerns the MPEG-2 video signal compression standard, ISO/IEC 13818-2, though it can be applied to any video compression system that is liable to degradation when coding and decoding are cascaded.

There has already been disclosed (WO-A-9535628) the use of a signal which accompanies an MPEG bitstream and which carries information about the bitstream for use in a downstream process, for example, the re-encoding of a decoded MPEG picture. This signal is provided in parallel and is sent along an appropriate side channel to accompany a decompressed signal from a compression decoder to a subsequent encoder.

Where equipment has been specifically designed for use with such a signal, considerable advantage can be gained and many of the problems previously associated with cascaded coding and decoding processes are removed or ameliorated by using in a downstream coding process, key information concerning upstream coding and decoding.

In WO-A-9803017, there are disclosed techniques which extend these advantages, in part or in whole, to arrangements which include equipment not specifically designed for use with such a signal. Specifically, these techniques include embedding the information signal in the video signal so that it can pass transparently through a video pathway.

It is an object of this invention to provide improved apparatus and processes which offer benefits not just in a cascaded recoding operation but in a primary coding operation.

Such a primary coding operation will usually be applied to a video signal which has not previously been compressed. The possibility is included, however, of a "primary" coding operation on a video signal which has been compressed but without advantage having been taken of any of the techniques disclosed in either of the above referenced documents.

Accordingly, the present invention consists, in one aspect, in a video signal process comprising the steps of analysing a video signal and taking compression coding decisions; forming a representation of the coding decisions for passage with the video signal along a video pathway and, downstream of the video pathway, compression encoding the video signal in accordance with said coding decisions.

In another aspect, the present invention consists in compression pre-processing apparatus, comprising means for analysing a video signal and taking compression coding decisions; means for processing the coding decisions and means for outputting the processed coding decisions for passage with the video signal along a video pathway.

The coding decisions may include the following information: picture dimensions; frame rate; picture structure (frame-coded or field-coded); picture type (I, P or B); whether macroblocks are intra-coded or use prediction; whether forward, backward or bi-directional prediction is used; motion vectors; transform type; quantizer visibility weighting matrices; quantizer step; bit rate and buffer state of a downstream decoder.

In this description, the term information bus is used to represent information relating to a coding operation, which information accompanies a decoded signal, a partially decoded signal or a yet-to-be-coded signal. More detail can be found with reference to WO-A-9535628. The information bus is preferably embedded within a video signal for example as disclosed in WO-A-9803017. The content of both WO-A-9535628 and WO-A-9803017 is herein incorporated by reference.

The invention will now be described by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a block diagram of a compression pre-processor according to one embodiment of this invention;

Figure 2 is a block diagram of a compression pre-processor according to a second embodiment of this invention; and

Figure 3 is a block diagram illustrating three alternative server-based processes according to this invention making use of the information provided by the pre-processor of Figure 1 or Figure 2.

Turning to Figure 1, an input video signal which has not previously been encoded is presented at input terminal 100 and passes to an MPEG2 encoder 102. This encoder takes one of the forms disclosed in WO-A-9535628 and has in addition to the MPEG output, an information bus output on which appear a representation of the coding decisions taken in the encoder. These coding decisions may include the following information: picture dimensions; frame rate; picture structure (frame-coded or field-coded); picture type (I, P or B); whether macroblocks are intra-coded or use prediction; whether forward, backward or bi-directional prediction is used; motion vectors; transform type; quantizer visibility weighting matrices; quantizer step; bit rate and buffer state of a downstream decoder.

The information bus then joins the input video signal for passage in tandem along a video pathway. It should be noted that the video signal at the output has undergone no processing, beyond delay in an appropriate compensating delay 104.

There are a variety of preferred ways in which the information bus can accompany the video signal. For example, the information bus can be carried in the least significant bit of the colour-difference part of a 10-bit ITU-R Rec. 656 signal, within the active video region only. This provides a raw bit-rate of 10.368 Mbit/s for the information bus. Care will be taken to ensure that the presence of this additional information does not cause visible impairments to the video signal and that studio equipment quoted as '10 bits' is indeed transparent to all ten bits of the signal when no mixing or other processing is being performed. In other implementations, the information bus might be transported in the 9th or 8th colour-difference bit, in the 10th, 9th or 8th luminance bit or in any combination of the above. Use of the 8th bit would also be appropriate for systems using earlier versions of the Rec. 656 standard where only 8-bit representation is available.

Another example is an extension of the above approach, in which any part of the digital video signal (not just the least significant bit) is modified by adding the information bus data to the video in such a way that a downstream MPEG coder would be unaffected.

It is also possible to carry the information bus in an ancillary data channel carried in the blanking periods of the Rec. 656 signal. It would be necessary to ensure that studio equipment passed this information unchanged when no mixing or other processing was being performed.

5 A still further example is to send the information bus as an AES/EBU digital audio channel. This would be passed through a spare channel in the audio path of the studio equipment. It would be necessary to ensure that switching of that particular audio channel would be performed along with the video switching, even though the main audio channel(s) might be switched independently of the video.

10 Figure 2 shows a more detailed configuration of a compression pre-processor according to the present invention. An information bus generator 202 receives the input video signal and generates a 'skeleton' information bus containing picture, GOP and sequence rate information relating to the input video signal, for example, picture size, aspect ratio, field/frame coding type and picture type. The video signal and the skeleton information bus are passed to a motion estimator 204. This generates candidate motion vectors which are placed on the Information Bus. A prediction selector 206 receives both the video signal and the information bus and selects between the different candidate motion vectors. It also selects which prediction mode (field, frame, forward, backward, bi-directional etc.) is to be used for each macroblock. The prediction selector 206 further performs inter/intra selection and DCT type selection.

20 The information bus at the output of the prediction selector 206 contains all the decisions necessary for the creation of an MPEG bitstream apart from those relating to quantization. These are provided as follows.

25 A "dumb" coder 208 operates on the video signal, guided by the coding decisions represented in the information bus. A bit rate controller 210 receives the coded bitstream and controls the quantization in the dumb coder to bring the output bit rate to a notional bit rate representing the probable output rate of a downstream encoder. The dumb coder then places on the information bus the quantizer information employed to generate a bitstream at the desired notional bit rate

30

So far, what has been described in Figure 2 is identical to an MPEG coder, based on the information bus as shown in the referenced prior publications. In this application, however, the bitstream is not used and only the final information bus appears at the output of the coder 208.

5 This information bus is then processed using techniques described in WO-A-9803017. Briefly, the information bus passes to an information bus coder 212 which performs variable length coding, packetisation and allocation of time stamps. This represents a convenient form of compression using, essentially, the MPEG2 syntax. Indeed, the information bus in one form can be viewed as the MPEG2 bitstream minus the DCT coefficients.

10 There are various possibilities for the format of an information bus signal, according to its timing relationship with the video signal it accompanies. Formatting is carried out by the information bus formatter 214. Examples of possible formats for the information bus signal are as follows:

15 (i) A fixed-bit-rate signal but containing a variable number of bits per picture and transmitted with no regard for synchronisation to the video signal. In practice, the signal could have a variable bit-rate but could be made to occupy a fixed-bit-rate channel by the use of stuffing bits.

20 (ii) A fixed or variable-bit-rate signal which is re-ordered (from bitstream order to display order within the GOP structure) and time-shifted so that the information bus for each picture is co-timed with the video signal for that picture.

25 (iii) A mixture of the two, in that the information bus itself is asynchronous but a small slot is reserved for some picture-locked data; this would carry, for example, duplicates of **time\_code** and **picture\_type**.

iv) A fixed-bit-rate signal which is re-ordered and time-shifted as described in the second option above, but additionally arranged so that the macro-rate information for each macroblock is co-timed with the video signal corresponding to the macroblock.

30 The formatted information bus then passes to a channel adapter 216, which adapts the information bus to accompany the video signal (which has been delayed in compensating delay 218) in any of the ways described by way of example with reference to Figure 1. Thus, in a preferred example, the

channel adapter 216 embeds the formatted information bus in the least significant bit of the colour-difference part of a 10-bit ITU-R Rec. 656 signal, within the active video region only.

In a modification to the arrangement illustrated in Figure 2, two or more dumb coders 208 and associated bit rate controllers 210 could work in parallel, each at a different bit rate covering the range of likely future requirements. The quantizer information generated at each bit rate could be recorded in the information bus.

In a further alternative, the bit rate controller 210 could be removed and the dumb coder or coders 208 could work with a fixed quantizer or quantizers. The resulting numbers of bits generated for each macroblock could then be recorded in the output information bus.

Figure 3 shows how a pre-processor according to this invention might be used in conjunction with a server designed for uncompressed video signals. The pre-processor works as described above to add an information bus to a digital video signal. The resulting video + information bus signal is written onto a server. There are then shown three examples of how the signal might be used downstream to produce bitstreams.

In each example, the signal is read from the server and sent to an Information Stream decoder which passes the resulting video and Information Bus signals to a dumb coder.

In the first example, dumb coder 1 simply slaves to the incoming video and information bus signals and produces a bitstream at the bit rate (or a chosen one of the bit rates) generated by the pre-processor.

In the second example, dumb coder 2 works at a new bit rate. The quantizer information in the information bus is ignored and is replaced by quantizer information calculated by the local bit rate controller.

In the third example, (enhanced) dumb coder 3 makes use of both the local bit-rate controller and the quantizer or bit-count information decoded from the information bus to improve the performance of the encoder. Effectively, the known benefit of two-pass encoding is obtained, that is to say pre-analysis and a second pass through the bit rate control process.



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Either of the second two configurations could be used as part of a bitstream switch or other bitstream processor in which it is necessary to control the bit rate and the occupancy of the coder buffer.

5 Whilst the use of an information bus which is effectively the MPEG stream minus the DCT coefficients, is extremely convenient, other options exist for representing the coding decisions. A range of formats could be employed and various compression techniques employed. In addition to the coding decisions, useful statistical information from the coding process can also be carried.

10 Note that the present invention is not confined to MPEG2 compression. It could be used with a wide variety of compression technique, or even with mixtures of techniques, although in this case the processing of the decoded information bus would be significantly more complicated, as it would involve the re-interpretation of coding mode information for a different compression  
15 scheme.

It should be understood that this invention has been described by way of examples only and a variety of further modifications are possible without departing from the scope of the invention.

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**CLAIMS**

1. A video signal process comprising the steps of analysing a video signal  
5 and taking compression coding decisions; forming a representation of the  
coding decisions for passage with the video signal along a video pathway and  
downstream of the video pathway compression encoding the video signal in  
accordance with said coding decisions.

10 2. A process according to Claim 1 wherein said representation of the  
coding decision comprises an information bus in which the coding decisions  
are represented in the same format as they are represented in the  
compressed bitstream which is the output of said downstream compression  
coding operation.

15 3. A process according to Claim 1 or Claim 2, wherein said analysis  
generates information relating to picture size and type.

20 4. A process according to any one of the preceding claims, wherein said  
analysis comprises the generation of candidate motion vectors.

25 5. A process according to Claim 4, wherein said analysis comprises the  
selection for each macroblock of the picture of a motion vector from said  
candidate motion vectors.

6. A process according to Claim 5, in which said analysis comprises the  
selection of a macroblock prediction mode.

30 7. A process according to any one of the preceding claims wherein said  
analysis includes a bit rate control and the taking of quantizer decisions  
appropriate to the maintenance of the selected bit rate.

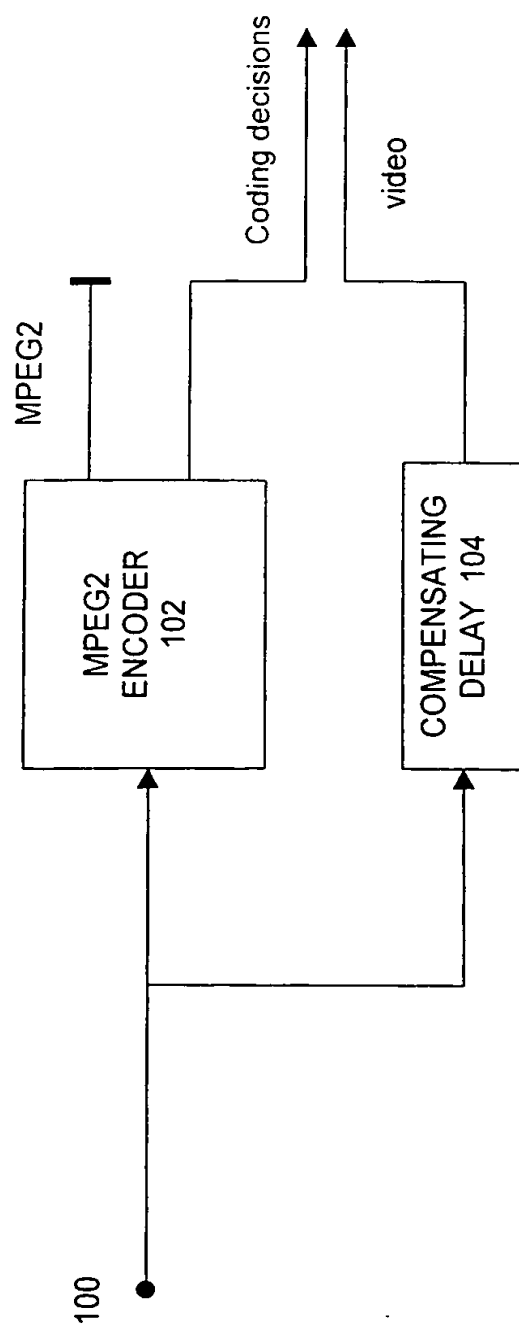
8. A process according to Claim 5 wherein plural bit rates are selected and plural quantizer decisions taken.

5 9. Compression pre-processing apparatus, comprising means for analysing a video signal and taking compression coding decisions; means for processing the coding decisions and means for outputting the processed coding decisions for passage with the video signal along a video pathway.

10 10. Apparatus according to Claim 9, wherein said means for processing the coding decisions provides a representation of the coding decisions in the form of an compressed video bit stream lacking transform coefficients.

11. Apparatus according to Claim 9, wherein said means for outputting the processed coding decisions serves to modulate one or more least significant bits of the video signal.

FIGURE 1



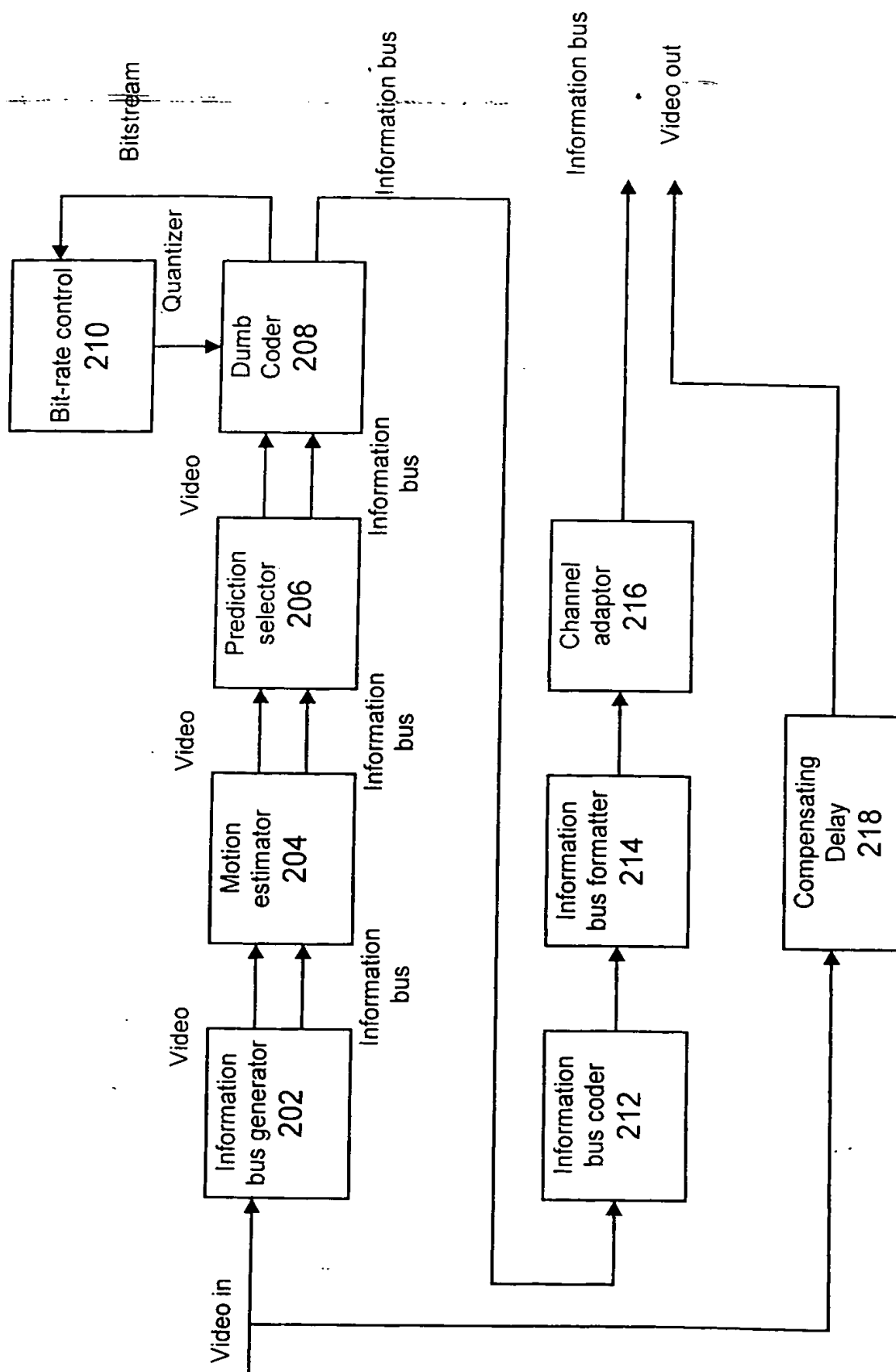


FIGURE 2

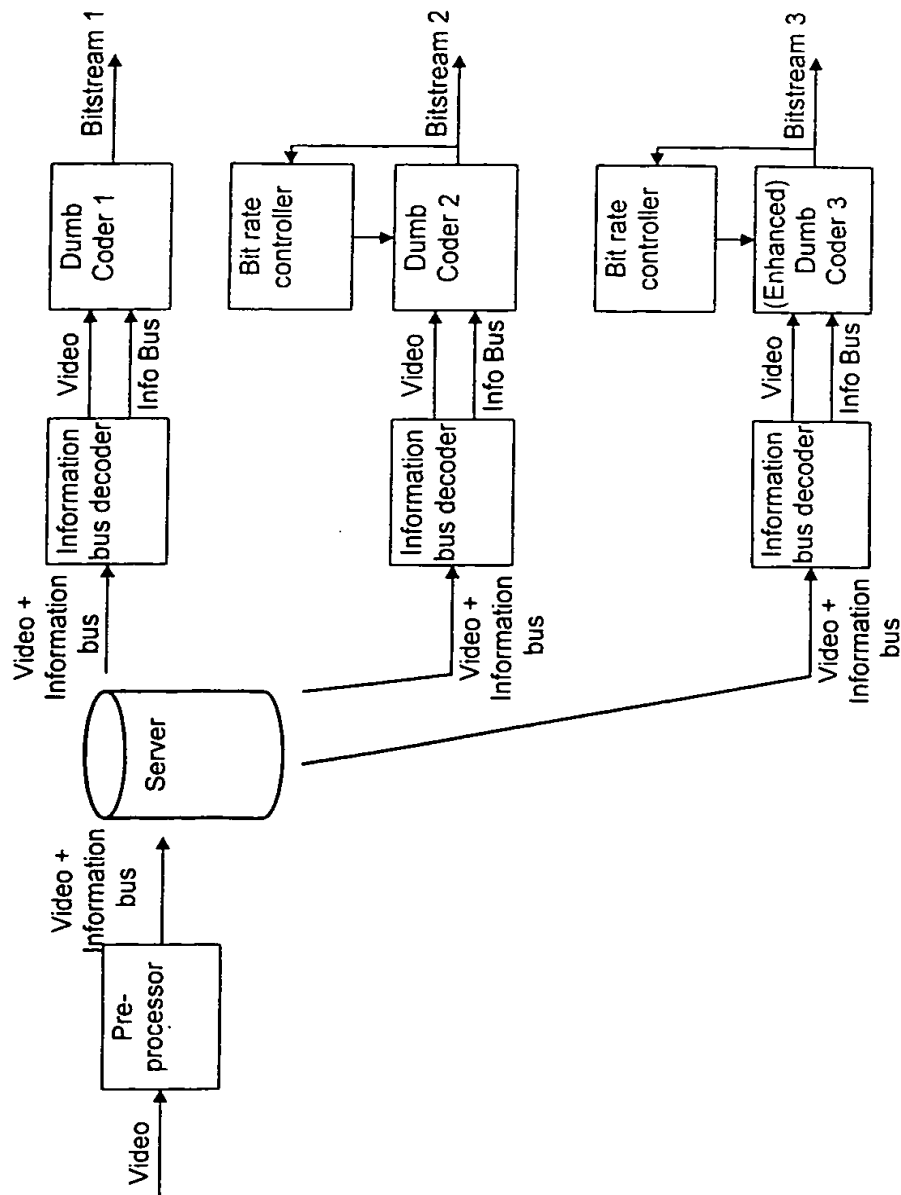


FIGURE 3



# INTERNATIONAL SEARCH REPORT

Internat. Pat. Application No.

PCT/GB 99/00228

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04N7/26

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PEREIRA M ET AL: "RE-CODABLE VIDEO" PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (IC, AUSTIN, NOV. 13 - 16, 1994, vol. 2, no. CONF. 1, 13 November 1994, pages 952-956, XP000522756 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS	1, 4, 5, 9
A	see abstract see paragraph 1 see paragraph 2 see figures 2,4  --- -/--	3, 6, 8

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"S" document member of the same patent family

Date of the actual completion of the international search

28 April 1999

Date of mailing of the international search report

11/05/1999

Name and mailing address of the ISA

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Authorized officer

## INTERNATIONAL SEARCH REPORT

Intern al Application No

PCT/GB 99/00228

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 597 647 A (SONY CORP) 18 May 1994	1,4,5,7,9
A	see abstract see page 3, column 4, line 13 - line 18 see page 4, column 5, line 30 - line 31 see page 4, column 5, line 34 - line 37 see page 4, column 6, line 31 - line 33 see page 6, column 9, line 4 - page 7, column 11, line 35	6,8
X	WO 95 15659 A (COMPRESSION LABS INC) 8 June 1995	1
A	see abstract see page 7, line 15 - page 8, line 17 see page 26, line 1 - line 9 see page 27, line 33 - page 29, line 14 see page 41, line 28 - line 34	3-6
X	WO 95 35628 A (SNELL & WILCOX LTD ;KNEE MICHAEL JAMES (GB); DEVLIN BRUCE FAIRBAIR) 28 December 1995	1-7,9,10
A	cited in the application see page 7, line 4 - line 8 see page 9, line 3 - page 12, line 13	8
P,X	WO 98 03017 A (BRITISH BROADCASTING CORP ;KNEE MICHAEL JAMES (GB); SNELL & WILCOX) 22 January 1998 see page 1, line 25 - page 2, line 3 see page 4, line 16 - line 31 see page 5, line 1 - line 20	1-7,9-11
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 449 (E-686), 25 November 1988 & JP 63 176049 A (NEC CORP), 20 July 1988 see abstract	1,9,11

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCI/GB 99/00228

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0597647	A	18-05-1994	JP 6153152 A	31-05-1994
			US 5640208 A	17-06-1997
WO 9515659	A	08-06-1995	US 5828786 A	27-10-1998
			AU 1210495 A	19-06-1995
WO 9535628	A	28-12-1995	AU 2744095 A	15-01-1996
			CA 2193109 A	28-12-1995
			EP 0765576 A	02-04-1997
			EP 0845908 A	03-06-1998
			JP 10503895 T	07-04-1998
WO 9803017	A	22-01-1998	AU 3454897 A	09-02-1998

REC'D 27 APR 2000

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>PDG/20388</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/GB 99/ 00228</b>	International filing date (day/month/year) <b>22/01/1999</b>	Priority date (day/month/year) <b>22/01/1998</b>
International Patent Classification (IPC) or national classification and IPC <b>H04N7/26</b>		
Applicant <b>SNELL &amp; WILCOX LIMITED et al.</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


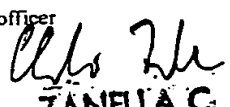
2. This REPORT consists of a total of 5 sheets, including this cover sheet.

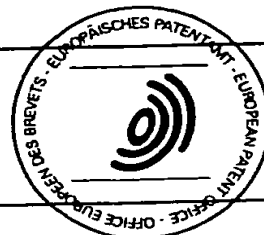
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consists of a total of 1 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand <b>03/08/1999</b>	Date of completion of this report <b>20. 04. 00</b>
Name and mailing address of the IPEA/  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0, Tx: 523656 epmu d Fax: (+49-89) 2399-4465	Authorized officer  <b>ZANELLA C.</b>



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/GB99/00228

## I. Basis of the report

1. This report has been drawn up on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*

☐ the international application as originally filed

☒ the description, pages 1-7, as originally filed  
pages, filed with the demand  
pages, filed with the letter of

☒ the claims, Nos. 2-11, as originally filed  
Nos., as amended under Article 19  
Nos., filed with the demand  
Nos. 1, filed with the letter of 15/03/00

☒ the drawings, sheets / fig. 1/3-3/3, as originally filed  
sheets / fig., filed with the demand  
sheets / fig., filed with the letter of

2. The amendments have resulted in the cancellation of:

☐ the description, pages:

☒ the claims, Nos. 1

☐ the drawings, sheets / fig.

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2 (c)).

4. Additional observations, if necessary:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/GB99/00228

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty	Claims	2-8, 10, 11	YES
	Claims	1, 9	NO
Inventive Step	Claims		YES
	Claims	1-11	NO
Industrial Applicability	Claims	1-11	YES
	Claims		NO

### 2. Citations and Explanations

Citations: D1 = WO-A-9535628  
D3 = EP-A-597647  
D4 = WO-A-9515659

The subject-matter of claim 1 does not meet the requirements of Art 33(2) PCT, since document D1 discloses (see figure 1): a video signal process comprising the steps of analysing an input video signal P (by means of pre-processor 10) and taking compression coding decisions (concerning for example "recommended motion vectors", see page 7, lines 1, 2); forming a representation of the coding decisions (see information bus IB); passing the representation (IB) along a video pathway (video pathway between blocks 10 and 12) with the input video signal P; and downstream of the video pathway compression encoding the input video signal (by means of coders 12 and 22, producing an MPEG-2 compressed video signal CP) in accordance with said coding decisions (IB).

The subject-matter of claim 1 therefore lacks novelty.

Attention is also drawn to the fact that document D1 also appears to disclose all the alleged inventive concepts of the present application, in particular

A) "... an information bus (which) extends from a decoder or to a coder in the chain, the information bus carrying information relating to a coding operation for use in a later signal process." (See characterising part of claim 1 of D1, see the physical format of the information bus on page 9)

B) the optional embedding of the coding information in the video stream (see signal CP between blocks 22 and 24 in Figure 1)

The subject-matter of claim 9 does not meet the requirements of Article 33(2) PCT, since document D1 discloses (see Figure 1): a compression pre-processing apparatus, comprising means (block 10) for analysing a video signal (P) and taking compression coding decisions (recommended motion vectors, for example, see page 7, lines 1, 2); means (the same block 10) for processing and for outputting the processed coding decisions (see information bus 1B) for passage with the video signal (P) along a video pathway (between blocks 10 and 12).

The subject-matter of claim 9 lacks therefore novelty.

It is further noted that the subject-matter of claims 1 and 9 also appears to lack either novelty or an inventive step having regard to each of the disclosures of documents D3 and D4.

Document D3 discloses (see Figure 1) an encoder (3) which encodes video data in accordance with coding decisions (frame structure, predictive mode, motion vector, quantising parameter) taken in advance by blocks 2 and 4.

Document D4 discloses (see Figure 3) an encoder (103) which encodes video data in accordance with coding decisions (either vertical frame-based filtering or vertical field-based filtering) taken by video data stream analyser 300 (see page 7, lines 27-32).

The subject-matter of dependent claims 2-8, 10, 11 appears only to relate to details of implementation of the known process and apparatus which are either already disclosed by the above cited documents or are considered to be within the freedom of the person skilled in the art. The subject-matter of dependent claims 2-8, 10 and 11 thus lacks an inventive step (Article 33(3) PCT).

The presently claimed subject-matter relates to the field of electronics and in particular to the design of electronic devices which are then manufactured by the industry. The present claims thus possess industrial applicability.

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

- 1) To meet the requirements of Rule 5.1(a)(ii) PCT the differences between the prior art disclosed by document D1 and the present invention should have been discussed in the description.
- 2) To meet the requirements of Rule 6.3(b) PCT the independent claims should have been properly cast in the two part form, with those features which in combination are part of the prior art being placed in the preamble.
- 3) Reference signs in parentheses should have been inserted in the claims to increase their intelligibility, Rule 6.2(b) PCT.
- 4) The consistory clause forming the disclosure of the invention as claimed should have been brought into agreement with the claims of the broadest scope, Rule 5.1(a)(iii) PCT.



17.03.00

CLAIMS

1. A video signal process comprising the steps of analysing an input video signal and taking compression coding decisions; forming a representation of the coding decisions; passing the representation along a video pathway with the input video signal; and downstream of the video pathway compression encoding the input video signal in accordance with said coding decisions.

2. A process according to Claim 1 wherein said representation of the coding decision comprises an information bus in which the coding decisions are represented in the same format as they are represented in the compressed bitstream which is the output of said downstream compression coding operation.

3. A process according to Claim 1 or Claim 2, wherein said analysis generates information relating to picture size and type.

4. A process according to any one of the preceding claims, wherein said analysis comprises the generation of candidate motion vectors.

5. A process according to Claim 4, wherein said analysis comprises the selection for each macroblock of the picture of a motion vector from said candidate motion vectors.

6. A process according to Claim 5, in which said analysis comprises the selection of a macroblock prediction mode.

7. A process according to any one of the preceding claims wherein said analysis includes a bit rate control and the taking of quantizer decisions appropriate to the maintenance of the selected bit rate.

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>PDG/20388</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 99/ 00228</b>	International filing date (day/month/year) <b>22/01/1999</b>	(Earliest) Priority Date (day/month/year) <b>22/01/1998</b>
Applicant <b>SNELL &amp; WILCOX LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

2



None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/GB 99/00228A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 H04N7/26

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PEREIRA M ET AL: "RE-CODABLE VIDEO" PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (IC, AUSTIN, NOV. 13 - 16, 1994, vol. 2, no. CONF. 1, 13 November 1994, pages 952-956, XP000522756 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS	1,4,5,9
A	see abstract see paragraph 1 see paragraph 2 see figures 2,4 --- -/--	3,6,8

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

28 April 1999

Date of mailing of the international search report

11/05/1999

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

 International Application No  
 PCT/GB 99/00228

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 597 647 A (SONY CORP) 18 May 1994  see abstract see page 3, column 4, line 13 - line 18 see page 4, column 5, line 30 - line 31 see page 4, column 5, line 34 - line 37 see page 4, column 6, line 31 - line 33 see page 6, column 9, line 4 - page 7, column 11, line 35 ---	1,4,5,7, 9 6,8
X A	WO 95 15659 A (COMPRESSION LABS INC) 8 June 1995 see abstract see page 7, line 15 - page 8, line 17 see page 26, line 1 - line 9 see page 27, line 33 - page 29, line 14 see page 41, line 28 - line 34 ---	1 3-6
X A	WO 95 35628 A (SNELL & WILCOX LTD ;KNEE MICHAEL JAMES (GB); DEVLIN BRUCE FAIRBAIR) 28 December 1995 cited in the application see page 7, line 4 - line 8 see page 9, line 3 - page 12, line 13 ---	1-7,9,10 8
P,X	WO 98 03017 A (BRITISH BROADCASTING CORP ;KNEE MICHAEL JAMES (GB); SNELL & WILCOX) 22 January 1998 see page 1, line 25 - page 2, line 3 see page 4, line 16 - line 31 see page 5, line 1 - line 20 ---	1-7,9-11
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 449 (E-686), 25 November 1988 & JP 63 176049 A (NEC CORP), 20 July 1988 see abstract -----	1,9,11

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/00228

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